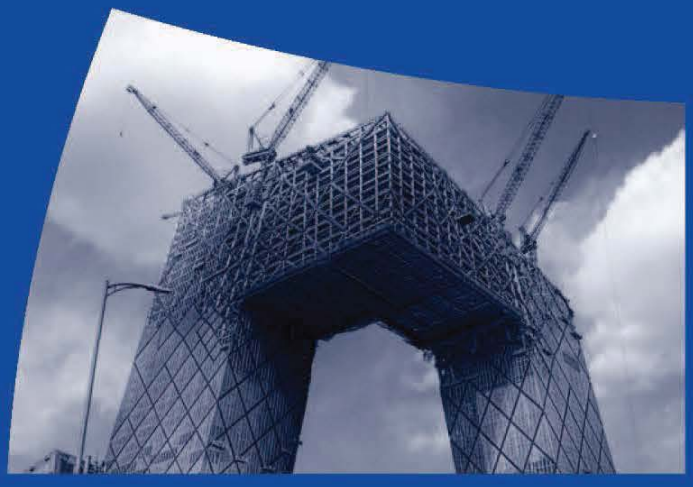
# DEFINITION OF SERVICES GUIDELINES

## Building Construction



Fédération Internationale des Ingénieurs-Conseils
International Federation of Consulting Engineers
Internationale Vereinigung Beratender Ingenieure
Federación Internacional de Ingenieros Consultores

**FIDIC** is an international federation of national Member Associations of consulting engineers.

FIDIC was founded in 1913 by three national associations of consulting engineers within Europe. The objectives of forming the Federation were to promote in common the professional interests of the Member Associations, and to disseminate information of interest to their members. Today, FIDIC membership covers more than 80 countries from all parts of the globe and encompassing most of the private practice consulting engineers.

FIDIC is charged with promoting and implementing the consulting engineering industry's strategic goals on behalf of Member Associations. Its strategic objectives are to: represent world-wide the majority of firms providing technology-based intellectual services for the built and natural environment; assist members with issues relating to business practice; define and actively promote conformance to a code of ethics; enhance the image of consulting engineers as leaders and wealth creators in society; promote the commitment to sustainability.

FIDIC arranges seminars, conferences and other events in the furtherance of its goals: maintenance of high ethical and professional standards; exchange of views and information; discussion of problems of mutual concern among Member Associations and representatives of the international financial institutions; development of the consulting engineering industry in developing countries.

FIDIC members endorse FIDIC's statutes and policy statements and comply with FIDIC's Code of Ethics which calls for professional competence, impartial advice and open and fair competition.

FIDIC, in the furtherance of its goals, publishes international standard forms of contracts for works and for clients, consultants, sub-consultants, joint ventures and representatives, together with related materials such as standard pre-qualification forms.

FIDIC also publishes business practice documents such as policy statements, position papers, guides, guidelines, training manuals and training resource kits in the areas of management systems (quality management, risk management, business integrity management, environment management, sustainability) and business processes (consultant selection, quality based selection, tendering, procurement, insurance, liability, technology transfer, capacity building).

FIDIC organises an extensive programme of seminars, conferences, capacity building workshops and training courses.

FIDIC publications and details about events are available from the Secretariat in Switzerland. Specific activities are detailed in an annual business plan, and the FIDIC website, www.fidic.org, gives extensive background information.



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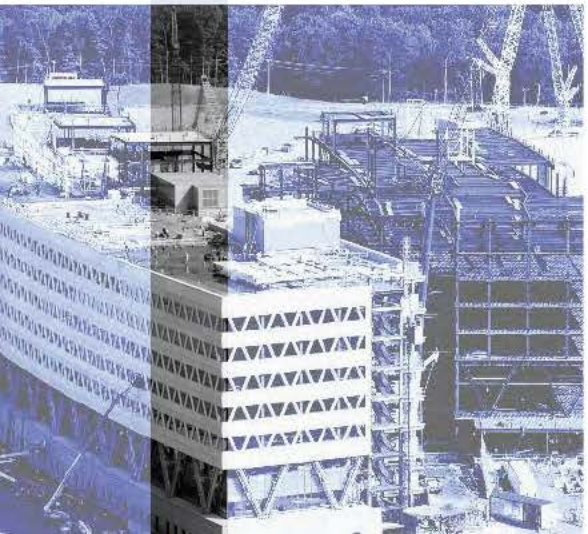
# Publications

A supplement to these *FIDIC Definition of Services Guidelines (Building Construction)* contains tables of Detailed Task Descriptions that can be used directly to specify services. The supplement can be downloaded in editable formats from www.fidic.org/dos and is available as a printed version from the FIDIC Bookshop, together with the printed version of these guidelines. Fully formatted electronic versions of both the guidelines and its supplement are available from the FIDIC Bookshop as Portable Document Files (PDF), see www.fidic.org/bookshop.



# Preface

The consulting engineering industry remains largely responsible for the planning, design, construction, inspection, and management of infrastructure needed to meet the world's ever increasing demand for food, water, sanitation, shelter, health services, transportation, and energy. Consulting engineers provide, on a daily basis, the solutions that improve the quality of people's lives while preserving our dwindling natural resources.

The work of the professional consulting engineer is as important today as it was a hundred years ago. However, detailed knowledge of the role that these experts play is not as satisfactory as it could be, even among those who directly engage consulting engineers. The more the services consulting engineers provide are understood, the more effective these services will be.

FIDIC is pleased to provide these guidelines, which attempt to a) consolidate the world's best practice for the definition of engineering services, and b) establish a basis for scoping, executing and benchmarking these services as appropriate.

Through these guidelines for defining services, FIDIC will help clients and their consultants match tasks and desired outcomes with skill sets and required deliverables to improve the effectiveness and profitability for both parties. In doing so, FIDIC has used the expertise and understanding of an international group of experienced industry practitioners, clients, consultants, and contractors.

# Acknowledgements

The *FIDIC Definition of Services Guidelines (Building Construction)* were prepared by the Definition of Services Task Group of the FIDIC Business Practices Committee (BPC). There was extensive consultation with the Standardisation Task Force of the European Federation of Engineering Consultancy Associations (EFCA) during their preparation.

The document draws largely upon *Design Documentation Guidelines* published in 2004 by the New Zealand Construction Industry Council.

The Task Group comprised:

- Gregs Thomopulos, *USA* (BPC Chair)
- Adam Thornton, *New Zealand* (leader)
- Axel Jaeger, *Germany*
- Rick Prentice, *Canada*
- Enrico Vink, *FIDIC*

# 1 Preamble

These guidelines aim to provide a clear template for the scope of a consultant's work through the different phases of a typical commission: design – procurement – construction. This will enable the client and consultant to:

- Define clearly, responsibilities from the outset and communicate these to all parties involved in the project.
- Define the scope of the consultant's work through the different phases of the project.
- Define, in particular, the level of design services required, which can be an area of considerable variance.
- Operate on a 'level playing field', achieving appropriate remuneration for the standard of design service required.
- Benchmark the services the client receives against best-practice standards.

The guidelines will also:

- Provide a quality assurance reference for users.
- Provide some standardisation and international portability of work phase definitions.
- Enable a consultant to differentiate himself from his peers.

The key requirements for defining the scope of a consultant's work are summarised in Appendix A – The Consultant's Brief, which provides a short guide for clients and their consultants that is applicable to all types of projects.

## 1 Introduction

The role of the engineering consultant is complex and at times ill-defined. The type and extent of services required and delivered varies greatly between projects. This document will guide consultants, clients and contractors to successful project outcomes by identifying the range of roles, services, tasks, and responsibilities of the parties and by enabling scope, engagement terms, level of interaction, and details of other factors to be defined and agreed as necessary in order to successfully deliver a project.

The document identifies and defines distinct project phases by the most prevalent name, lists the more common regional alternatives and includes work tasks often done by other consultants, government agencies, funding agencies, contractors, and/or client groups. There is potential for some tasks to fall in different project phases, to occur in two or more phases, or in some cases such as alternate project delivery, to overlap from phase to phase. What is important is that the consultant understands and conveys to the client an understanding of the necessary tasks and which party is responsible for each task.

These guidelines will set a benchmark for all parties involved in a project. Careful identification of the client brief and the client's needs, together with advice from consultants to clients on the most advantageous outcomes, are important ancillary functions that should be linked to the guidelines.

The commentary below provides background to the development of the guidelines and outlines how they may be used by both clients and their consultants.

The guidelines are also intended as general checklists and benchmarks to define the process for building construction projects, infrastructure/civil engineering projects and industrial process plant projects. They are not intended to provide the definitive solution to the design process and should not be regarded as a replacement for detailed briefs, carefully developed in open consultation between a client and service provider. The guidelines will be updated from time to time to reflect best industry practice.

The guidelines are also intended to be tailored to the appropriate level of project complexity and service agreed with the client. It will be seen that checklists with tick boxes are provided which can be used to define the services directly related to the design process.

# 1 Preamble

## 2 Background

While the performance of engineering consultants is critical to the success of any construction project, there are only a few documents that define the scope and output of a consultant's work.

Design documentation provides the critical tie between all the parties in a construction project, but there is a lack of definition of design documentation upon which the parties can rely. As a result, there has been a trend towards lower standards for documentation. This can lead to frustration and cost overruns for clients and contractors and fee pressure on those consultants who seek to provide a complete service.

Improvements in technology, engineering knowledge, choice of materials, and other similar aspects have led to greater project complexity. At the same time, in many parts of the world, there has been a general decrease in the skill base and productivity of the construction workforce. These factors have led to a requirement for more complete documentation.

The timeframe for delivering projects has also decreased significantly in recent years. All stages of the programme have reduced, from the design phase through to completion of the project, thus putting increased pressure on all participants.

## 3 How to use the guidelines

The guidelines outline the processes that all construction projects go through (irrespective of the procurement methodology, the regulatory approval process or the programme) and identify the design process, outputs and deliverables.

Clients and consultants can use the guidelines to define the scope of services that the consultant will provide and to benchmark the consultant's design deliverables; contractors can use them to measure the quality of the documents that are provided.

It is important that all parties understand the nature of design. Design is an evolutionary process, developing from a set of client-driven objectives. There are often substantial changes within each of the project phases. Ideally, the fundamental elements of the previous phase should not be overturned.

The guidelines can also be used to define the responsibilities of the various parties throughout each of the project phases. A supplement to these guidelines gives Detailed Task Descriptions, with Appendix B giving examples. The level of service provided by a consultant or designer could be curtailed at any of the stages, in which case the parties completing the process will need to carry out the remaining steps in a coordinated manner to achieve an effective design.

## 4 The importance of coordination in the design process

The thorough coordination of design documents between disciplines is considered to be the single most important issue confronting the consulting engineering industry around the world. The guidelines emphasise the need for a relatively formal coordination of the information that each discipline provides at the completion of each design phase.

The role of the primary design coordination may be undertaken by the principal consultant, or by any party commissioned to do so. It must be emphasised that all design disciplines have a responsibility for design coordination.

To assist the design practitioner, Sample Coordination Checklists have been assembled in Appendix C. These are generic, and are not exhaustive. Design teams are therefore encouraged to develop appropriate checklists to suit each project's needs.

The need for coordination extends into the construction phase. The coordination of contractor-designed elements, or of elements specified on a performance or proprietary design basis, is usually carried out by the contractor. This can require a major effort and the roles and responsibilities for this work must be clearly defined.

## 5 Impact of the contractor procurement methodology on consultant services

The essential services provided by the consultant are not affected by the method of contractor procurement. The guidelines have been laid out assuming a traditional design – procure (tender) – construct sequence. However, they are easily adapted for other forms of contract/procurement (see Fig. 1).

The input of the design consultant into the contractor procurement methodology and the construction phase is important in the quest for well-delivered projects. Therefore, appropriate consultants should be involved in the process used to procure a contractor.

The determination of the construction contract procurement and the conditions of contract, the methodology for pricing or tendering, and the execution of the contracts should be defined at an early stage of the design process, so that the documentation can be arranged accordingly. FIDIC has published various guidelines relating to alternative forms of project delivery.

## 6 How the guidelines relate to the consent and approval regimes

All projects will generally need to address various requirements for a variety of different types of approvals depending on whether they are client, legislative, regulatory, environmental, or funding approvals. Under FIDIC contracts, for example, the *FIDIC Construction Contract*, the client shall provide reasonable assistance to the contractor for a) obtaining copies of the laws of which are relevant to the project but are not readily available; and for b) the contractor's applications for any permits, licences or approvals required by law which the contractor is required to obtain.

The guidelines have been laid out for a conventional consents and approval process that covers environmental, planning, land use, building, funding, and occupation. However, the process can be easily adapted for a different sequence of consents, permits and approvals (see Fig. 1).

## 7 How the guidelines relate to the management of the design process

Design management to integrate design and construction processes may be undertaken by the design consultants, client, project manager, contractor or specialist design manager. Because of the varied structure of project teams, design management is not addressed in these guidelines. However, the following comments are provided:

- Design management may overlap with some of the design processes listed in the guidelines. Design management includes: the direction of consultants; chairing and minuting of regular project meetings; managing information flow to and from the client; administration of the design delivery programme.
- Responsibility for the design management role needs to be confirmed and formalised at the start of the project, and the scope of this role either included in the consultant's scope of services or defined separately.

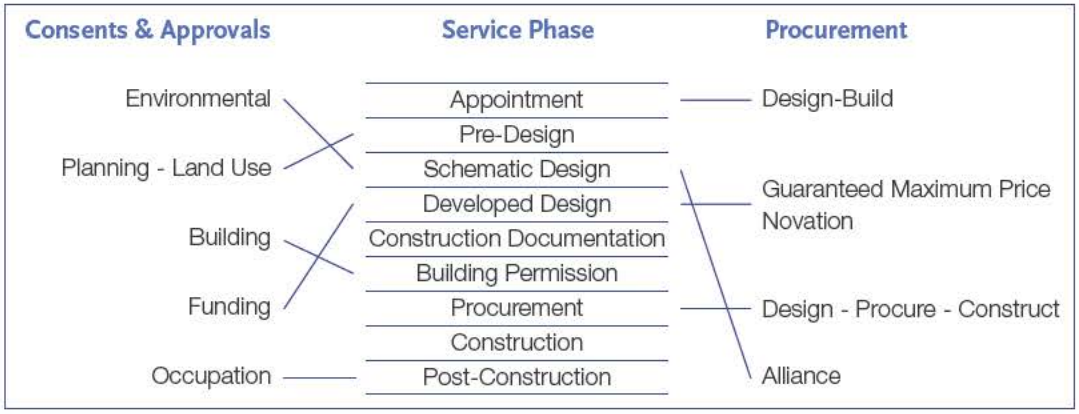



Fig. 1 - Relationship between service phase and the consent and procurement processes.

## 8 Value Engineering design reviews during the design process

Value Engineering (VE) or Value Management as it is known in some areas, can be a very worthwhile exercise if undertaken in a fully coordinated manner and at the appropriate time. The use of VE reviews may add short-term cost and long-term value, so the applicability and likely usefulness should always be discussed with the client.

Value Engineering reviews at the appropriate stage(s) of the design process will also help in achieving successful projects. However, reviews undertaken too late can be ineffective and impact adversely on the programme and costs. Fig. 2 illustrates the potential value of early reviews.

Generally speaking, VE reviews should be carried out at the end of the Concept and/or Preliminary Design Phases (see Section 3 for the definitions of project phases), where the design has been coordinated between the design disciplines, and there is a consistent basis for a cost estimate. The necessary revisions that are identified as part of the VE review can then be introduced at the start of the next design phase.

The *FIDIC Construction Contract* for mainly client-designed works incorporates a VE clause that is designed to encourage mainly the contractor, but also the engineer under the contract, to seek to derive mutual benefit, by sharing net gains, during a project's construction phase.

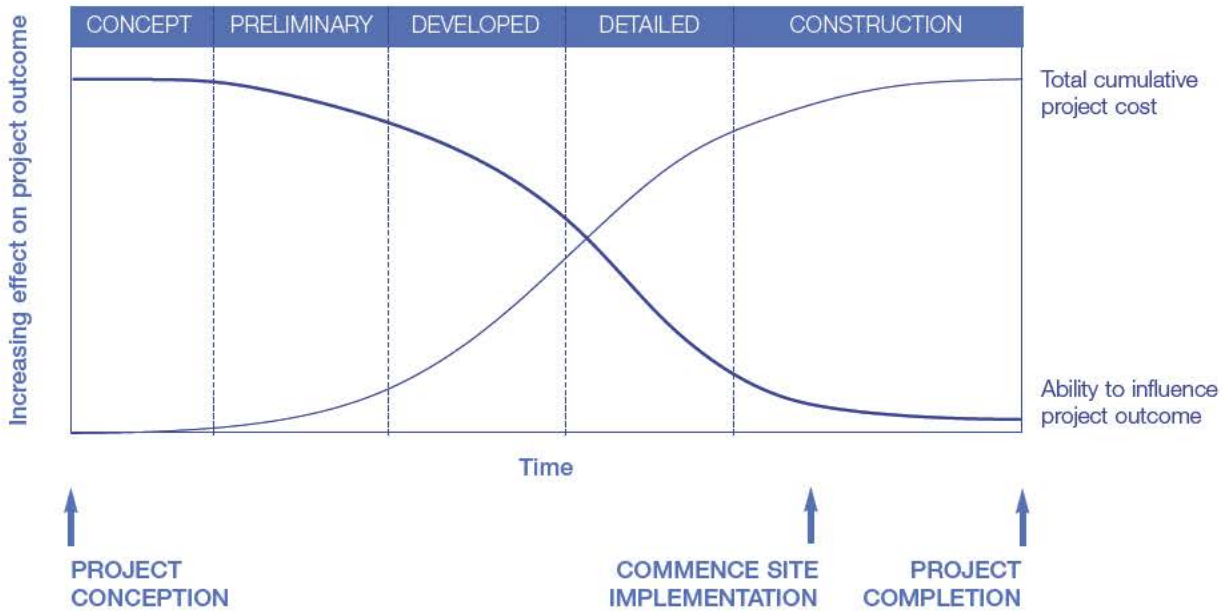



Fig. 2 - The effectiveness of a Value Management review at various stages of the design process.

## 9 The importance of safety

Keeping safety foremost during the design process can have a positive impact on the safety of the construction process. Efficiencies can be gained through fewer injuries, less down-time and improved communication and coordination, resulting in a more effective and efficient design and building programme. Designers should aim to:

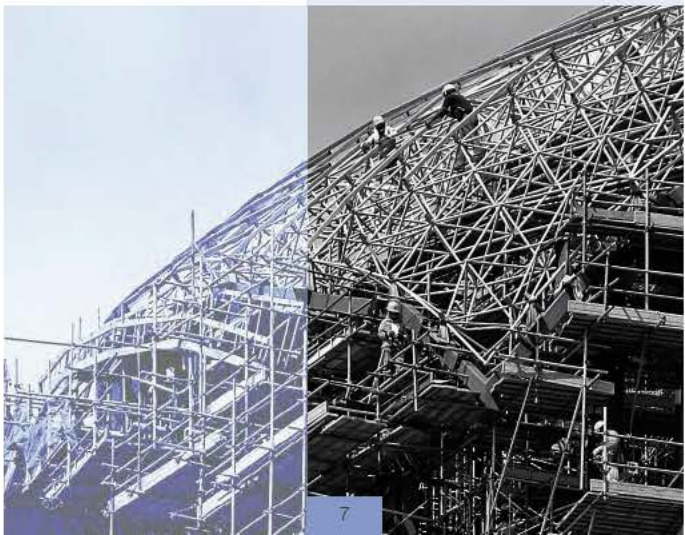
- Identify significant and unusual health and safety hazards relevant to the design, and consider how the building or project may be safely occupied, operated and maintained.
- Consider the risk from those hazards which may arise as a result of the design.
- If possible, alter the design to avoid the risk or, where this is not reasonably practicable, implement risk control processes.

Designers should be aware of the hierarchy of risk control – eliminate, isolate, minimise – that underpins the modern approach to health and safety management.

The contractor controls the means and method of construction and is normally responsible for managing health and safety risks during the construction of a project. All those involved in building design and construction need to be aware of their obligations under local health and safety legislation which can transfer significant liability to the designer and the site engineer.

## 10 Sustainability management – environmentally sustainable design

Sustainability considerations, including energy efficiency concerns, are rapidly becoming commonplace in all areas of construction and design. Consultants, and especially designers, should ensure that they understand the client's sustainability focus, the statutory requirements and public expectations. They should then be involved in setting sustainability and energy efficiency targets. FIDIC has well established guidelines in these areas, notably *FIDIC Project Sustainability Management Guidelines*, 2004.



# 2 Project Types

There are several different types of projects for which consultant services are required. They are:

- Building construction projects
- Infrastructure/civil engineering projects
- Industrial process plant projects

These guidelines demonstrate how consultant services are defined in the case of building construction projects. At the same time they illustrate how the scope of services should be defined. Additional guidelines will be published in due course covering details relevant to the two other types of projects.

# 3 Building Construction Projects

## 3.1 Introduction

The nine phases (with the alternative names in italics) of consultant services in a building construction project are:

1 Scoping of Services Phase
*Engagement or Appointment Phase*
2 Pre-Design Phase
*Programming Phase*
3 Schematic Design Phase
*Concept or Preliminary Phase*
4 Developed Design Phase
*Design Development Phase*
5 Construction Documentation Phase
*Detailed Design or Working Drawings Phase*
6 Building Permission Application Phase
7 Procurement Phase
*Contract Award/Bidding/Negotiation Phase*
8 Construction Phase
*Project Supervision/Construction Monitoring Phase*
9 Post-Construction Phase
*Commissioning/Defects Liability/Project Control Phase*

Buildings today are much more complex than only a few years ago in all facets, including form, structure, services, and cladding. Building elements are much more tightly designed than in the past. This has resulted in a situation where typical building details often do not apply to large portions of the project, resulting in a higher volume of documentation and many interface issues. The quality of design documentation and coordination are thus critical to the success of any building construction project.

Typical of building construction projects is the use of numerous specialist design consultants covering different engineering disciplines, often drawn from different consulting practices. Table 1 lists the disciplines of specialist and non-specialist designers that may be included.

For building construction, separate design documentation guidelines can be envisaged for the primary design disciplines of:

Structural Engineering
Architecture
HVAC
Electrical Engineering
Hydraulics
Fire Safety
Ancillary Services

The input from specialist designers covering:

| Primary design disciplines | Type of designer | | Detailed Task Description | | | |
|---|---|---|---|---|---|---|
| | Non-specialist | Specialist | Phase 3 | Phase 4 | Phase 5 | Phase 8 |
| Structural Engineers | x | - | Section 1A | Section 1B | Section 1C | Section 1D |
| Architects | x | - | Section 2A | Section 2B | Section 2C | Section 2D |
| Planners | - | x | - | - | - | - |
| Building Services Engineers | | | | | | |
| - HVAC | x | - | Section 3A | Section 3B | Section 3C | Section 3D |
| - Electrical Engineers | x | - | Section 4A | Section 4B | Section 4C | Section 4D |
| - Hydraulics | x | - | Section 5A | Section 5B | Section 5C | Section 5D |
| - Vertical Transportation | - | x | - | - | - | - |
| - Communications | - | x | - | - | - | - |
| - Fire Safety Engineers | x | - | Section 6A | Section 6B | Section 6C | Section 6D |
| Geotechnical Engineers | - | x | - | - | - | - |
| Acoustic Engineers | - | x | - | - | - | - |
| Wind Specialists | - | x | - | - | - | - |
| Façade Engineers | - | x | - | - | - | - |
| Security | - | x | - | - | - | - |
| Ancillary Services | x | - | Section 7A | Section 7B | Section 7C | Section 7D |

Table 1 - The disciplines of designers involved in the phases of a building construction project that involve design. Also listed are the sections in the *FIDIC Definitions of Services Guidelines (Building Construction) Supplement - Detailed Task Descriptions* giving the Detailed Task Descriptions for non-specialist designers.

# 3 Building Construction Projects

Planning
Vertical Transportation Engineering
Geotechnical Engineering
Acoustic Engineering
Wind Specialities
Façade Engineering
Security Engineering

will need to be effectively co-ordinated with the design team. Separate guidelines will usually not be created for these specialist consultants as their work is normally coordinated by one of the principal design consultants.

As indicated in Table 1, *FIDIC Definitions of Services Guidelines (Building Construction) Supplement - Detailed Task Descriptions* gives detailed checklists of tasks carried out by non-specialist designers during Phases 3, 4, 5, and 8 that involve design. Tasks during the other project phases are generic across all consultant disciplines so these tasks are not considered. Appendix B gives the Structural Engineering checklists as examples.

The *Sample Co-ordination Checklists* of Appendix C have been developed on the basis of the architect having the primary role of design co-ordination, as this has traditionally, but not always, been the case for most building construction projects.

A key to a successful project is good control and 'set-out' of building dimensions in the documentation. For building construction projects, the architect generally has responsibility for dimensions. However, on some projects (e.g., light industrial or specialist buildings) the consulting engineer acts as the principal or 'prime' consultant, taking responsibility for dimensions. Therefore, in the Schematic Design Phase (Phase 3, see below) it is necessary to define who is responsible for dimensions. The dimensional control and set out would only be defined in design documentation guidelines for architectural tasks. Therefore, on the projects where the consulting engineer is responsible for dimensions, the relevant architectural tasks would need to be copied over from the list of task descriptions.

## 3.2 Definition of phases in building construction

### 1 Scoping of Services Phase

The Scoping of Services (or Engagement or Appointment) Phase concerns the scope of the consultant's work and agreement on the terms and conditions of engagement. It may be through a process based on Quality Based Selection principles (as recommended by FIDIC) or through a design tender process and/or through a formal or informal Request for Proposals (RFP) process. The Scoping of Services Phase is the time to agree on the appropriate limits of liability and expectations relating to Errors and Omissions. It may require information relating to the issues listed below, where it is noted that some items will be predetermined by an 'educated' client (in any case, clients may wish to take professional engineering advice in preparing a RFP):

- Determine the scope of works (and/or the method by which the scope may be varied).
- Agree the scope of services ('brief'): use this document, with exclusions and a process for scope variation.
- Agree the scope and relevant timing of services to be provided directly by the client.
- Discuss with the client (and document when possible), expectations and the definition of quality, of both the services and of the project works.
- Agree and define the sustainability focus to be employed on the project.
- Agree and define the integrity management protocols.
- List sub-consultants, if any.
- Agree conditions of engagement.
- Agree the fee basis and the method of fee variation.
- Agree the limit of liability (for the prime consultant and sub-consultants) and list any liability exclusions, e.g., asbestos, contamination, radiation, etc.
- List information to be supplied by the client.
- List deliverables to be supplied by the consultant (reports, drawings, specifications, calculations, statements of compliance, translations, etc.)
- Agree the programme (or schedule) for services.
- Ensure that the consultant team includes all the competencies required to complete the work.
- Demand an evaluation study (if done in this phase the study would normally be carried out by the client or by a consultant engaged separately).

Output:
- Engagement of consultant(s)

## 2 Pre-Design Phase

The Pre-Design (or Programming) Phase is about setting the parameters for the project, and may involve the following tasks:

- Site evaluation/procurement
- Topographical survey
- Survey of existing structures
- Preliminary/desktop geotechnical study (or preliminary investigation)
- Environmental status assessment
- Heritage/archeological assessment
- Planning restraints evaluation
- Regulatory framework evaluation, i.e., reviews of laws, statutes, by-laws, and regulations that may impact upon the project. This task may include a first contact with consent authorities to seek guidance/rulings on technical/planning requirements.
- List consents and permits that will be required.
- Agree with the client an appropriate form of project delivery (contractor procurement).
- Preliminary estimates some +/- 30% (higher for complex work).

Outputs:

- Reports
- Bulk and location sketches
- Rough cost estimate

## 3 Schematic Design Phase

The Schematic Design (or Concept or Preliminary) Phase generally involves the application of a design 'idea' to the practical provision of a facility. It represents a phase where sufficient design concepts are developed for the client to be able to establish the feasibility of the project or the development potential of a site, or to be able to select a particular conceptual approach that the client wishes to pursue. The phase may be used to define or verify the consultant's brief, and may often involve the testing of different approaches/options.

During the Schematic Design Phase, ideas (schemes/concepts) are developed through open discussion by the design team of the key elements of the project. It will generally include the further refinement of the preferred concept(s) to facilitate testing against inputs from the team, including cost estimates and regulatory approval. The outcome of the phase may provide sufficient information for the communication of the design to a third party for marketing or consultation purposes.

During this phase the project concepts are developed into firm schemes, where the relationship and sizes of spaces and facilities are defined, and co-ordinated between the design disciplines. However, resolution of individual details that do not impact on the key elements are generally left for the next design phase. The phase will thus constitute 20-35% of the total 'design' effort.

At the end of the Schematic Design Phase, the project should be clearly defined and the design would be commonly referred to as being 'frozen'. Regulatory planning (or environmental approvals), as distinct from technical compliance for building consent, are typically applied for on completion of this phase. It should be noted that regulatory approvals refer to applying for consent from the relevant authority (the central government, a local/regional government, an environmental agency, etc.). This may cover use, bulk and location, appearance, environmental effects, traffic assessment, public health assessment, etc. Consequently, some practioneers may consider that the application for planning consent should be an additional phase.

The Schematic Design Phase is likely to include the following tasks:

- Environmental Impact Assessment
- Site specific investigation of geotechnical, contamination, wind, acoustic, etc.
- Preliminary analysis/design in all disciplines
- Evaluation of alternatives
- Preliminary sizing of primary/key elements
- Description/outline of secondary elements
- Preliminary review of utility supply capacity: electricity; gas; telecommunications; water; wastewater.
- Indicative specification (schedule of finishes)
- Cross-discipline coordination
- Pre-consent application meetings with the regulatory authorities
- Review against brief
- Value Engineering Review
- Preliminary risk assessment
- Estimates on a 'square metre rate' basis

Outputs:

- Design features report
- Preliminary drawings
- Estimates
- Risk identification report
- Planning/environmental consent applications

## 4 Developed Design Phase

The Developed Design (or Design Development) Phase is when the scope of all components in the design is clearly defined and coordinated. This may involve production of detailed information, including sketch details of all significant components and their inter-relationships.

During the Developed Design Phase, individual technical experts prepare the necessary documentation to define the scope of all building elements. Major input is required by all designers: it may constitute 60-65% of the total design effort.

The completion of the Developed Design is a critical point in a project. The scope of the project is fully defined. As a result, cost estimates can be prepared on an element-by-element basis. Developed Design generally provides sufficient information for the client/user to clearly understand the aesthetics and functionality of the project and its facilities.

On some projects the Developed Design documentation is issued for technical compliance/building consent and/or for profit and overhead tenders. Coordination between the design disciplines and thorough scope definition is therefore critically important at the end of this stage. The Developed Design Phase is likely to include the following:

- Analysis/design in all disciplines of primary/key elements
- Detailed review of utility supply capacity: electricity; gas; telecommunications; water; wastewater.
- Plans and elevations of primary/key elements
- Drawings of typical and key details
- Analysis of generic secondary elements
- Drawings showing scope/extent of secondary elements
- Generic element-by-element specifications
- Define elements to be covered by proprietary design (design and/or shop drawings by the contractor).
- Cross-discipline coordination
- Review against brief
- Testing against serviceability and 'ultimate limit state' (or overload) requirements.
- Value Engineering Review
- Detailed risk assessment
- Preliminary peer review, i.e., if the design is being reviewed by an independent engineer then at this point the following may be reviewed: engineering concept, load/process path, analysis/computer model, etc.
- Highlight and address health and safety issues for the future occupants and for those who will service and maintain the facility.
- Estimates on an element-by-element basis

Outputs:

- Updated design features report
- '60%' drawings
- Specifications
- List of elements where scope has not been fully identified elsewhere in the document
- Estimates
- Updated risk identification report

## 5 Construction Documentation Phase

The Construction Documentation (or Detailed Design or Working Drawings) Phase generally provides a level of documentation that clearly defines the design, specification and extent of all elements. The design should be comprehensively coordinated with all disciplines. The consultant's documentation should be considered to be 100% complete. However, the documents produced in this phase may not directly be able to be built from (e.g., shop drawings may be required from the contractor). Changes to anything other than details at this stage are very disruptive and expensive, and often result in further problems since, by now, the project has become very complex and it is hard to identify all the ramifications of changes. Construction (or detailed design) documentation is most commonly used to obtain a tender for the construction of the works and is usually used to establish regulatory compliance with codes, standards, by-laws, statutes, and the like.

The Construction Documentation Phase is likely to include the following tasks:

- Final analysis/design in all disciplines, of all elements
- Plans, elevations and details of all elements, sufficient to fully define the scope, quality and the design intent.
- Full 'trade' specifications
- 'Performance-based specifications' for elements to be covered by proprietary design (or design by the contractor).
- Full cross-discipline coordination
- Review against brief
- Testing against serviceability and ultimate limit state (or overload) requirements.
- Final peer review
- Update risk assessment
- Highlight significant and unusual health and safety issues that are likely to affect the construction sequence.
- Pre-tender estimates
- Estimate of construction programme

Outputs:

- 'For Construction' drawings and specifications
- Updated design features report, estimates and risk identification report.
- Technical documentation for tender
- Documentation for 'building consent' (or permit) including calculations where appropriate.
- Certificates of design compliance (or producer statements and design certificates), including peer review reports.

## 6 Building Permission Application Phase

The Building Permission Application Phase involves obtaining regulatory approvals, typically from local or central government agencies, for technical compliance issues (structural loadings, fire protection, access for disabled persons, etc.). These technical approvals are typically known as building permits or building consents.

Regulatory planning/environmental consent/permit (as distinct from technical compliance/building consent) is typically applied for at the completion of Phase 3 (Schematic Design Phase). However, in some jurisdictions a) planning consent may occur concurrently with building consent; and b), building permission may be sought at the completion of Phase 4 (Developed Design Phase), but this will depend of the level of compliance documentation required by the regulatory authority.

Typically the Building Permission Application Phase may include:

- Preparation of building permit forms and the payment of fees.
- Submission of drawings, specifications, calculations and design certificates (producer statements).
- Review of the design by a peer reviewer
- Response to queries raised by the regulatory authority or by the peer reviewer.
- Modification of the design or documentation at the request of the regulatory authority to incorporate consent conditions.

Output:

- Building approval

## 7 Procurement Phase

The Procurement (or the Contract Award/Bidding/ Negotiation) Phase involves the preparation of contractural bidding or tendering documents and the calling and letting of contracts for the construction works. Some clients will carry out much of this phase in-house. It should be noted that in projects where alternative procurement strategies are used (design-build, alliancing and other variants) the prime contractor may have been engaged earlier in the process. In any event, detailed 'trade' pricing is likely to occur at this stage.

Typically, this phase may include:

- Preparation of contract documents (conditions of tendering and conditions of contract, both preliminary and general, etc.).
- Specification of:
  - insurance conditions
  - programme (construction schedule)
  - quality plan requirements
  - health and safety plan requirements

- Specify integrity management protocols
- Pre-qualifying tenderers
- Calling tenders
- Evaluating tenders, including design alternatives
- Negotiation with preferred bidder(s)
- Recommendation of tender acceptance to client
- Signing of contract documents

Output:

- Construction contract with the successful bidder

## 8 Construction Phase

During the Construction (or Project Supervision/Construction Monitoring) Phase the physical works are built and the consultant is involved in some form of quality control monitoring or construction supervision (inspection). It is critical to define the level of this monitoring and to have tied the level of monitoring to the original definition of responsibilities of the consultant.

Appendix D – *Construction Monitoring Service*s describes the various levels of service that can be supplied by the consultant during the Construction Phase for all project types, including building construction.

There are also ongoing design activities. The Construction Design is where the requirements defined in Detailed Design documents are integrated with changes that may occur during the tender and contract process, and with construction requirements such as site conditions, proprietary and performance-based design elements, erection requirements, and fabrication shop drawings to create drawings that can be 'built' directly.

It should be noted that:

- Shop drawings are produced during this stage.
- During this phase, documentation is usually prepared by the contractor, or under the contractor's control.
- 'Temporary Works Design' is often necessary. This is design that is required to safely construct the building: falsework, formwork, shoring, hoardings, crane foundations, and the like.

Work for the consultant during the Construction Phase is likely to include the following:

- Construction monitoring/review of quality and consistency with design.
- Review of shop drawings and proprietary design elements.
- Issuing of instructions, variations and change orders
- Valuation/negotiation of variations
- Issuing of payment certificates
- Preparation of lists of defects
- Issue of the completion certificate

## 9 Post-Construction Phase

The Post-Construction *(or **Commissioning/ Defects Liability/Project Control)*** Phase involves completion of the contract and verification of the project quality and scope.

Work for the consultant during the Post-Construction Phase is likely to include the following:

- Settlement of the final account
- Monitoring of the commissioning of plant and equipment (this may also occur during the Construction Phase).
- Installation of the client's fixtures, fittings and equipment (FF&E).
- Collection of as-built drawings and operation manuals
- Collection of all verification documentation, quality checklists, proprietary design certification, and construction producer statements.
- Collection and verification of warrantees and guarantees.
- Obtaining compliance certification (statutory completion or licence to occupy, both temporary and permanent) from the regulatory authority.
- Ongoing maintenance period inspections
- Final inspection and sign-off
- Post services evaluation and feedback by the client (optional).

## Appendix A
# The Consultants Brief

## Defining the consultant's scope of work

A guide for consultants and clients that is applicable to all types of projects

### Introduction

The consultant's brief is a vital document since it defines the relationship between the client and the consultant in terms of the scope of work, deliverables, the programme, and the contractual relationship.

All consultant commissions, even those that do not involve a formal selection process, require a well-defined brief.

A brief can be used for the calling of competitive proposals. However, selection on price alone will not result in the lowest overall cost for a project.

A well-prepared brief will enable the consultant to submit relevant information on a range of attributes (skills, relevant experience, personnel, insurance coverage, etc.) that will then allow the client to make a selection based on quality (see *FIDIC Guidelines for the Selection of Consultants*, 1st Edition, 2003).

### Scope of Services

In broad terms, defining the scope of professional services can happen in one of two ways.

In the first form, a client may have a problem, or at least may require a solution, the nature of which is unknown is not defined at the time a consultant is engaged. In this situation, a client and consultant need to work together to define the scope and likely deliverables before fees are agreed. In this scenario, it is highly unlikely that any attempt to select solely on the basis of the fees for service would result in an optimum solution.

In the second form, the client is usually able to define quite precisely the scope, services and deliverables required from a consultant. In this situation, if the client can identify a consultant or a number of consultants who will meet the requirements and expectations, then it may be appropriate to include price as a selection attribute, provided that the scope of services and deliverables is completely defined. An informed client will appreciate that full service includes consideration of alternatives and a refined design to achieve the optimum solution.

### Agreement

Following both of the forms of scope definition, the scope of services becomes an integral part of an agreement for services, which forms the contract between the client and the consultant (see *FIDIC Client/Consultant Model Services Agreement*, 4th Edition, 2006).

### Key Requirements

The key requirements for the consultant's brief are:

Client details
- Client contact details
- Nature of client's business
- Vision/objectives that the client has for the project
- Tenant/end user details (if different from the client)
- Requirements for stakeholder consultation
- Confidentiality requirements

Project details
- Description of project
- Details of location, size and estimated cost or budget
- Required outcomes
- Levels of quality required
- Clearly defined scope of services for each consultant

Project team makeup
- List of team members, e.g., client, project manager, other consultants, sub-consultants, contractors
- Organisation chart
- Responsibility matrix
- Likely method of contractor procurement

Technical brief
- The relevant standards to be used
- Particular requirements for the loading, services, future flexibility, etc.
- Particular requirements for durability and plant processes
- Requirements for internal/external peer reviews
- Particular or unusual site conditions (environmental sustainability or project sustainability management) requirements
- Relevant statutory requirements (if not obvious)
- Requirement to reuse existing plant/equipment/materials

# Appendix A
# The Consultants Brief

### Project staging and programme
- Breakdown of design stages:
  - Schematic Design Phase (Phase 3)
  - Developed Design Phase (Phase 4)
  - Construction Documentation Phase (Phase 5)
  - Construction Phase (Phase 8)
- Timetable for delivery of documentation
- Expected timing/programme of physical works
- Requirements for early occupation, partial completion, etc.
- Impact on existing operations/occupants
- Programme for consents and approvals

### Attendance and reporting by the consultant
- Requirements for attendance at, and reporting to, meetings (project control, design coordination, construction/site, etc.)
- Requirements for attendance at workshops (design review, risk assessment, project procedures, value management, etc.)

### Deliverables
- Comprehensive lists of deliverables (reports, drawings, specification, etc.)
- List to include frequency/number of issues and number of sets per issue
- Guidelines/benchmarks for the quality of project documentation

### Construction monitoring
- Level/intensity of monitoring required (see Appendix D)

### Project cost control (budget)
- Method by which cost control will be measured and managed
- Value Management processes
- Relative priority of capital expenditure versus operating costs
- Cost reporting procedures

### Information to be supplied by the client
- Pre-project studies
- Survey/title information
- Geotechnical information
- Existing drawings

### Client approval process
- Process by which client will progressively approve the design during the documentation stages

### Scope/design variation
- Process by which variations in the consultant's scope of work will be handled in terms of fee and programme

### Risk management
- How risks will be identified
- How risk will be managed and mitigated

### Quality assurance
- Level of quality assurance required
- Requirement for a project-specific quality plan

### Contractual issues
- Conditions of engagement to be used
- Sub-consultant relationships
- Level of professional indemnity insurance to be carried by the consultant
- Limit of liability to be carried by consultant
- Level of public liability insurance to be carried by the consultant
- Basis of dispute resolution

### Health and safety issues
- Detail of site access and health and safety issues during the design stages of the project
- Required role/involvement by the consultant in health and safety during the construction stages

### Integrity management
- Required protocols for integrity management

### Selection criteria
- Quality Based Selection
- Direct negotiation
- Brookes Law
- Price-based

### Levels of service
- Full/partial
- Quality/quantity of documentation

### Fees
- Fee basis
  - Time and disbursement
  - Percentage of total construction value
  - Percentage of disciple value
  - Lump sum
- Definitions of Normal and Additional Services
- Basis for project/fee variations

## Appendix B
# Detailed Task Descriptions (Building Construction)

The supplement *FIDIC Definition of Services Guidelines (Building Construction) – Detailed Task Descriptions* to these guidelines gives sample checklists of task descriptions for the four phases of building construction that involve design, namely:

3 Schematic Design Phase
4 Developed Design Phase
5 Construction Documentation Phase
8 Construction Phase

The checklists cover the following non-specialist consulting disciplines:

- Structural Engineering
- Architecture
- HVAC
- Electrical
- Hydraulics
- Fire Safety
- Ancillary Services

Task descriptions for the phases that do not involve design are generic across all consultant disciplines. Sample checklists for these generic tasks are not given in the supplement.

Task descriptions for the key consultant disciplines in other types of projects (infrastructure/civil engineering; industrial process plant) will be published separately.

While the nine project phases defined in the *FIDIC Definition of Services Guidelines (Building Construction)* reflect international consultation, these sample checklists should only be considered as samples. Moreover, there may be variations to these services supplied in different countries, as well as variable definitions for these services, so the sample checklists of task descriptions are best seen as guidelines.

As examples, reproduced in this appendix are the Detailed Task Descriptions for Structural Engineering.

## Structural Engineering

Phase 3: Schematic Design Phase (Building Construction)

### Design Process

#### Inputs

- ☐ Client brief, including budget & time schedule
- ☐ Survey information, including legal & physical
- ☐ Architectural sketch concept drawings, e.g., bulk & location
- ☐ Preliminary fire engineering (where appropriate)
- ☐ Preliminary wind studies (where appropriate)
- ☐ Preliminary acoustic advice (where appropriate)
- ☐ Preliminary geotechnical report, including preliminary design parameters
- ☐ Design programme
- ☐ Site constraints, including planning & fire issues
- ☐ Conditions of consents
- ☐ Existing building & site information/records

#### Design

- ☐ Structural type & form
- ☐ Main gravity & lateral load resisting systems
- ☐ Floor system
- ☐ Ground retention systems
- ☐ Foundation system
- ☐ Façade support systems
- ☐ Roof support systems
- ☐ Identify structural scheme options
- ☐ Special project features concepts, e.g., large canopies
- ☐ Design co-ordination of key elements with other disciplines
- ☐ Identify responsibility for control & set-out of dimensions
- ☐ Identify responsibility for design co-ordination & management
- ☐ Evaluate & select primary structural systems
- ☐ Define grid layout (with the architect)
- ☐ Preliminary analysis to establish critical member sizes for primary elements
- ☐ Define key serviceability criteria
- ☐ Design co-ordination of key elements with other disciplines
- ☐ Define floor to floor heights
- ☐ Preliminary assessment of floor vibration & building movement
- ☐ Preliminary assessment of primary members of existing buildings

### Deliverables

#### Drawings

- ☐ Sketch drawings
- ☐ Drawings outline primary members as mark-ups of architectural drawings (1:200)
- ☐ Proposed primary framing
- ☐ Preliminary sizes of primary members only with
- ☐ reinforcing as kg/m$^3$ & steel as kg/m
- ☐ Preliminary foundation layout
- ☐ Indicative structural connection types
- ☐ Outline system for secondary elements
- ☐ Outline durability/coating systems
- ☐ Indicative surface finish for exposed concrete
- ☐ Critical details that may have significant cost implication
- ☐ Proposed primary elements of strengthening for existing buildings (where appropriate)

#### Specifications

- ☐ Outline specification of key structural elements

#### Reports

- ☐ Sketch drawings where necessary within report
- ☐ Structural concept design brief, including floor loadings
- ☐ Key risks & assumptions
- ☐ Concept report outlines key issues & options considered
- ☐ Design brief, including fire protection requirements for structural members
- ☐ Design features (options) report, with recommended option to take to developed design
- ☐ Outline of elements not covered in preliminary design drawings or design features report
- ☐ Define assumed construction methodology governing design (where appropriate)
- ☐ Highlight 'significant' buildability issues & significant/unusual health & safety issues arising from the structure

- ☐ Address durability requirements
- ☐ Preliminary input to the architect on 'architectural' elements
- ☐ Identify high risk and/or cost elements in structure
- ☐ Define key elements of ground retention system (if required)
- ☐ Define design parameters for façade systems
- ☐ Incorporate additional structural implications of fire & acoustic requirements
- ☐ Assess implication of dynamic motion of building services equipment
- ☐ Consider buildability of primary structural system, including significant health & safety issues during construction
- ☐ For unusual structures or existing structures where stability may be affected by the sequence of construction, consider significant health & safety issues
- ☐ Assess maintenance requirements of structural components, including health & safety issues
- ☐ Coordinate relevant design information between disciplines

Comments

1 The Schematic Phase is often split into concept & preliminary phases on larger projects.
2 Costing on square metre rate basis or preliminary elemental basis.
3 Agree roles & responsibilities for all participants in project procurement process.
4 Discuss with the client requirements & programme for client information & approvals.
5 Establish project procedures for communication, document issue, approvals, etc. Note that larger projects may have a project procedure manual or web-based document control systems.
6. Establish a design programme for key milestones & deliverables including design team coordination.
7 Where appropriate carry out discussion with a 'preferred' contractor on construction methodology.
8 Consultation with the local authority is recommended on key aspects of the design that may be considered outside the 'Acceptable Solution' & unusual/contentious issues.
9 Contribute to Value Management session, if required.
10 Agree the scale of drawing deliverables for each phase according to project type.
11 A specialist façade design consultant may need to be engaged, if the façade system is particularly complex or demanding.

## Structural Engineering

Phase 4: Developed Design Phase (Building Construction)

### Design Process

#### Inputs

- ☐ Client approval of preliminary design, including ratification of the cost estimate
- ☐ Final Geotechnical report
- ☐ Final wind report (if required)
- ☐ Final fire report

#### Design

- ☐ Determine sizes of all primary & most secondary structural members; however, there may be some architectural & services secondary support members not defined at this stage
- ☐ Generic connection details
- ☐ Agree serviceability performance criteria with the client (e.g., floor vibration, interstorey drifts, etc.)
- ☐ Structural input to architectural elements
- ☐ Confirm building movements with the design team
- ☐ Incorporate likely erection/construction requirements (where appropriate), including consideration of significant/unusual health & safety issues arising from the structure
- ☐ Key support details for façade elements
- ☐ Structural support requirements for building maintenance systems (e.g., BMU & abseil anchor points)
- ☐ Coordinate relevant information with other disciplines

### Deliverables

#### Drawings

- ☐ Drawings (1:100 plans) defining all primary framing members, with reinforcing as kg/m$^3$
- ☐ Layout & size of secondary framing members (e.g., lift, stairs, canopies & platforms)
- ☐ Generic reinforcing details for typical primary elements
- ☐ Typical connection details for primary elements
- ☐ Define elements covered by proprietary design (e.g., precast floor & piling)

#### Specifications

- ☐ Preliminary technical specifications, including durability & serviceability issues

#### Reports

- ☐ Updated design brief, including fire protection requirements for structural members
- ☐ Updated design features report, including serviceability & maintenance issues
- ☐ Define key risks & assumptions, including erection/buildability & significant/unusual health & safety issues arising from the structure
- ☐ List elements where the scope has not been fully defined elsewhere in the documents

#### Comments

1. Separate primary reinforcement from secondary stirrup or ties in quantity estimates.
2. Cost estimates at this stage can be produced by the Quantity Surveyor on an elemental basis, with secondary elements estimated on typical details.
3. Design and documentation may be sufficiently developed to lodge for building consent.
4. Developed Design generally provides the level of documentation to define the scope of all building elements.
5. Where appropriate, carry out discussions with a 'preferred' contractor on construction methodology.

## Structural Engineering

Phase 5: Construction Documentation Phase (Building Construction)

### Design Process

#### Inputs

- ☐ Client approval of completed developed design, including ratification of the cost estimate

#### Design

- ☐ Complete the design & coordination of all structural elements, including connection details, except for elements that can be adequately covered by non-specific design codes
- ☐ Address serviceability & maintenance criteria in the design
- ☐ Highlight significant/unusual health & safety risks arising from the structure that were identified through the design process (if any)

### Deliverables

#### Drawings

- ☐ Drawings defining all structural elements, including plans, elevations, sections, & details, with cross-referencing
- ☐ Define all connections by either defining specific connection details or referencing to industry standard connection details (e.g., HERA connection details) or specifying forces for a propriety connection system
- ☐ Construction sequences & positions of control/construction joints
- ☐ Include stairs, plant platforms & façade system support
- ☐ Reinforcing details defined (see comments below)
- ☐ Precamber/set established for members
- ☐ Include seismic & gravity support of ceiling/partition systems (optional)

#### Specifications

- ☐ Detailed specifications for each structural trade
- ☐ Performance specifications where appropriate, including performance criteria for proprietary design
- ☐ Method statements for critical construction processes governing design
- ☐ Design loadings for design of proprietary non-structural elements e.g., glazing; seismic bracing of services
- ☐ Define deliverables from contractor, e.g., producer statements, shop drawings & testing requirements, coating requirements for structural elements that are not addressed by the architect or other disciplines
- ☐ Define required tolerances if different to industry standards

#### Comments

1 Detailed design generally provides a level of documentation to clearly define the design of all structural elements. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2 Reference the architectural plans or other disciplines for other dimensions (unless agreed otherwise).
3 Reinforcing details defined means that all reinforcing required to construct the project is defined on the drawings, in quantum & size, such that shop drawings and/or bar bending schedules can be produced by others without further additional information.
4 Design & documentation of secondary architectural elements are generally shown on the architect's drawings; the structural engineer will have input where requested by the architect.
5 The contractor is responsible for managing health & safety risks during the construction phase.
6 Structural drawings should dimension the main building grids, critical structural elements & other elements that are the direct responsibility of the structural engineer.
7 The level of design details shown on drawings in this phase, particularly for concrete & masonry elements, varies in the industry between regions, building type & procurement methodology. A major factor is the capability of the local building industry to efficiently provide the construction phase documentation. The level of details outlined in these guidelines is appropriate where the contractor has the skills & resources to efficiently provide construction phase documentation. For some projects, a greater level of detailing may need to be produced by the design consultant. The appropriate level of detailing required should be agreed with the client prior to the commencement of the project.
8 Define in appropriate specification the significant/unusual health & safety risks arising from the structure identified in the design.

## Structural Engineering

Phase 8: Construction Phase (Building Construction)

### Design Process

#### Inputs

- ☐ Construction programme & methodology, including craneage or access restrictions
- ☐ Client approved ('For Construction') drawings & specifications
- ☐ Design & performance requirements for propriety elements

#### Design

- ☐ Design of proprietary systems, e.g., flooring, glazing, plant support, etc.
- ☐ Detailed co-ordination required with other disciplines, site conditions, proprietary elements, erection requirements & shop details
- ☐ Prepare structural construction sequence & temporary erection
- ☐ Structural input to architectural elements
- ☐ Confirm building movements with the design team
- ☐ Determine the impact of temporary erection loads & construction sequence on structural members & connections
- ☐ Check the design of structural members & connections for temporary construction conditions & loads, & redesign if required
- ☐ Liaise with the design & construction teams to coordinate any revisions to the detailed design

### Deliverables

#### General

- ☐ Drawings (including shop drawings & rebar schedules) on an elemental basis, including position, dimension, materials & finish of all details, including relevant material specifications (steel, timber, precast, etc)
- ☐ Site management plans and/or method statements defining the construction sequencing & temporary erection requirements
- ☐ Details of the temporary works
- ☐ Revision of drawings, details & specifications arising from contract agreement, building consent & construction requirements

#### Concrete

For non-standard conditions the following is to be provided where applicable:

- ☐ Formwork
- ☐ Propping & bracing
- ☐ Scaffolding & access
- ☐ Proprietary system layout drawings & connection details
- ☐ Embedded items & penetrations defined & located

#### Steel

- ☐ Shop drawings generally as defined in Australian Detailer Handbook ASDH101 or the American Institute of Steel Retailers Guidelines

#### Review

- ☐ Review shop drawings, technical specification & construction method statement submissions for consistency with detailed design

#### Contents

1 Before the commencement of construction drawings the following needs to be in place: contract details confirmed and tender accepted; sub-contract agreements confirmed; and owner-supplied components available.
2 Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., "the details have co-ordinated the relevant design information across all disciplines and can be built from".
3 Final determination of some dimensions may depend on the proprietary design of non-structural elements (e.g., mechanical services' duct sizes). Such proprietary design may need to be advanced to enable structural dimensions to be completed.
4 The contractor is responsible for managing health and safety risks during the construction phase

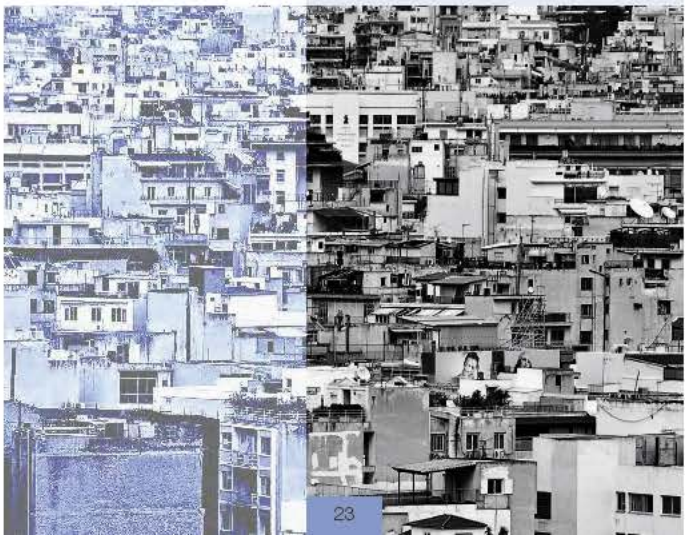
## Appendix C
# Sample Coordination Checklists

The thorough co-ordination of design documents between disciplines is considered to be the single most important issue confronting the consulting engineering industry, around the world. These design documentation guidelines emphasise the need for a relatively formal coordination of the information each discipline provides at the completion of each design phase.

To assist the design practitioner, Sample Coordination Checklists have been developed. The role of primary design coordination may be undertaken by the principal consultant or any party commissioned to do so. It must be emphasised that all design disciplines have a responsibility for design coordination.

The Sample Coordination Checklists are generic, and are not exhaustive. Therefore, design teams are encouraged to develop appropriate coordination checklists to suit the needs of each project. This appendix provides sample checklists that can be used as the basis for developing project-specific checklists.

The need for coordination extends into the Construction Phase. The coordination of contractor-designed elements or of elements specified on a performance or proprietary design basis is usually carried out by the contractor. This can require major effort and the roles and responsibilities for this work must be clearly defined.



Appendix C
# Sample Coordination Checklists

## Architect/Coordinating Consultant

| Design Process | Included in scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Verify that limits of existing and new work are clearly shown (additions and renovations only). | | o | o | o | o | |
| Verify all structural elements and dimensions against structural drawings. | | | | o | o | |
| Compare elevations to floor plans; check all features shown on both. | | o | o | o | o | |
| Compare building sections to elevations and plans; check all features on both. | | o | o | o | o | |
| Compare detail wall sections with building sections. | | | o | o | o | |
| Verify that all details are referenced on plans, elevations and sections. | | | o | o | o | |
| Verify rough openings for doors and windows against schedule and structural. | | | | o | o | |
| Verify movement joint locations and cross-check with structural engineer requirements. | | | | o | o | |
| Compare schedule of finishes with ceiling and wall finish notes. | | o | o | o | o | |
| Check lighting fixture layout against electrical plan and schedules. | | | | o | o | |
| Check diffusers, grilles and registers against mechanical plans. | | | | o | o | |
| Check vent locations against reflected ceiling plans and elevations. | | | | o | o | |
| Verify door schedule data including sizes, types, frame conditions, fire ratings, etc. | | | | o | o | |
| Verify hardware and door furniture schedule against door schedule and specification. | | | | o | o | |
| Compare door swings with electrical switch locations. | | | | o | o | |
| Verify fire rated wall locations and details. | | | o | o | o | |
| Verify ratings of doors in fire rated walls. | | | o | o | o | |
| Check all dimensions. | | | o | o | o | |
| Verify fit of cabinets and items of equipment. | | | | o | o | |
| Verify that material descriptions are in specification and not on drawings. | | | | o | o | |
| Verify data on room finish schedule against all other drawings; check room names and numbers, ceiling heights and finishes | | | | o | o | |
| Check detail of plan enlargements against small-scale plans. | | | o | o | o | |
| Where plan of one floor is on more than one drawing, check match of all meeting lines. | | | | o | o | |
| Check that completed documents are adequate for the building consent requirements of the territorial authority. | | | | o | o | |
| Verify with the client the location of site access and extent of the construction area. | | o | o | o | o | |
| Check services risers are the correct size required and vertically align plan to plan. | | | o | o | o | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Check structural element, lifts and stair wells vertically align plan to plan. | | | o | o | o | |
| Check that ground levels and contours coordinate with information and are correctly shown on elevation and sections. | | o | o | o | o | |
| Locate all in-ground services, power poles, footpaths, existing buildings and existing feature that need to be shown on site and floor plans. | | o | o | o | o | |
| Check the acoustic requirements of building elements and indicate their required construction and scope. | | o | o | o | o | |
| Check that toilet areas comply with the building code in numbers of fittings, disabled access requirements and service requirements. | | o | o | o | o | |
| Check that window and door sections are adequate or have sufficient strengthening to take the design wind and seismic loads set by the engineer. | | | o | o | o | |
| Have the engineer review all hand rail, balustrade, veranda/balcony and canopy elements to ensure all are of sufficient size and have adequate fixings to meet the required design loads. | | | | o | o | |
| Provide references on plans to all sections, wall sections, external and internal elevations, stair and core larger stake drawings, etc. | | o | o | o | o | |
| Check that stairs, ramps, handrails and egress ways comply with the building code for surface slip resistance spread of flame, light levels and signage, general setout, safety from falling and disabled access requirements. | | o | o | o | o | |
| Provide buildings setout datum and reduced levels to all floors, ceilings, parapets, lift towers and other design elements. | | o | o | o | o | |
| Provide tile setout point for floors and walls. | | | o | o | o | |
| Check that services trenches, penetrations, plinths, and nibs required are shown on floor plans and slab setout plans (if provided). | | | o | o | o | |
| Review all expansion and control joints required for slabs, blockwork, solid plaster, sheet products, and concrete products and check that thay are shown on plans, elevations and sections. | | | | o | o | |
| Review size and location of seismic joints required by the engineer, having the engineer review the details produced. | | | | o | o | |
| Ensure that all openings have lintels reviewed by the engineer. | | | | o | o | |
| Have the engineer review the bracing design. | | | o | o | o | |
| Review to ensure that sufficient set-downs are provided to checks and terraces and to the adjacent ground to meet the requirements of the building code and disabled persons' access. | | | o | o | o | |
| Review access panels and hatches to ensure these have been provided to services for maintenance as required by the services engineers. | | | | o | o | |
| Ensure safety restraints and anchoring points are provided to roofs and external facades; have the engineer review their design. | | | | o | o | |
| Confirm the size and fall of the gutters, downpipes and overflows with the hydraulics engineer. | | | o | o | o | |
| Check if a lighting conductor required. | | | o | o | o | |

Appendix C
# Sample Coordination Checklists

## Specifications

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Determine form of conditions of contract or obtain copy of the conditions of contract. | | | o | o | o | |
| Review project file and determine any Special Conditions. | | | o | o | | |
| Write the preliminaries section. | | | | o | o | |
| Check preliminaries section for compatibility with other parts of the contract and other disciplines. | | | | o | o | |
| Circulate conditions of contract and preliminaries to the client/quantity surveyor/project manager for their review and comments. | | | | o | | |
| Confirm whether the quantity surveyor will provide a schedule of quantities. | | o | o | o | | |
| Provide outline specification of materials and finishes. | | | | o | | |
| Review progress drawings. | | | o | o | | |
| Compile a draft list of all specification sections and subsections required. | | | o | o | | |
| Confirm specification sections' titles. | | | o | o | | |
| Confirm specification format and style. | | | o | o | | |
| Obtain and coordinate architect's and engineer's specification sections, review and format. | | | | o | | |
| Request list of all 'builders work' items for all other consultants. | | | | o | | |
| Determine if any sections are likely to require performance specifications; if the answer is "yes", agree on method of performance testing. | | | o | o | | |
| Prepare draft list of standards likely to be needed for reference; obtain those not in library. | | | | o | | |
| Provide specification data request list to coordinate with other team members. | | | | o | | |
| Confirm completion schedule for specification sections and related drawing groups. | | | | o | | |
| Develop suggested list of alternatives with the client. | | | | o | | |
| Review drawings as completed, deleting proprietary names (Note: generally the specification should reference proprietary names, not the drawings). | | | | o | o | |
| Confirm the specification of any required staging of construction; check against preliminary construction schedule. | | | | o | o | |
| Check schedule of finishes, material and equipment against specification indexes; confirm all finishes, material and equipment are included. | | | | o | o | |
| Confirm that the final issue of drawings matches the specified schedule of drawings exactly. | | | | o | o | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Verify all specification cross-referencing. | | | | o | o | | |
| Eliminate all references as 'by others'; determine and note responsible party. | | | | o | o | | |
| Check all specification references to drawings ('as indicated'; 'as shown') and verify they are so indicated, and that drawing references to specifications are covered. | | | | o | o | | |
| Check major equipment listings against drawings. | | | | o | o | | |
| Confirm the schedule of monetary provisions. | | | | o | o | | |
| Obtain the client's agreement on contingency sum allowances and authority for expenditure. | | | | o | o | | |

## Structural Engineering Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Confirm that column coordinate numbering on structural matches architecturals. | | | o | o | o | |
| Check set-back lines and building location (to roof overhang lines, if so defined). | | | | o | o | |
| Compare bottom of footing levels with water level. | | o | o | o | o | |
| Verify that all footings are on an undisturbed bearing or that areas of compaction are shown; check bottom of footing elevations. | | | o | o | o | |
| Check perimeter slab dimensions against architectural; check perimeter offset from grid line. | | | | o | o | |
| Verify that all depressed or raised slabs and penetrations are shown. | | | o | o | o | |
| Verify all slab profiles; check architectural and civil. | | | | o | o | |
| Check dimensions of all grade beams and piers against architectural. | | | o | o | o | |
| Compare roof framing plan dimensions and coordinates against foundation plan coordinates. | | | o | o | o | |
| Check support/corrections to cladding and window systems. | | | | o | o | |
| Check location of rooftop equipment supports against mechanical. | | | | o | o | |
| Check location and sizes of all structural penetrations against building services. | | | o | o | o | |
| Check location of roof drains against hydraulics (for interior drains). | | | o | o | o | |
| Check location of roof drains against architectural (for external drains). | | | o | o | o | |
| Confirm that all columns and beams are listed in column and beam schedules. | | | | o | o | |
| Confirm length of all columns in column schedule against architectural sections. | | | | o | o | |
| Verify that all structural sections are referenced to plans and elevations. | | | o | o | o | |
| Verify that all details referenced on plans and sections have been drawn and fit the conditions. | | | | o | o | |
| Verify all movement joint details and locations against architectural. | | | | o | o | |
| Check that any details identified as 'typical' are in fact typical, with any major exceptions noted. | | | o | o | o | |
| Confirm that the final data on equipment weights and floor loadings match the brief and has been co-ordinated with other disciplines. | | | o | o | o | |
| Check for missing or incomplete drawing notes. | | | | o | o | |
| Confirm that structural calculations have been submitted where required by authorities. | | | | o | o | |
| Confirm that any notes referenced as 'see other disciplines' have been covered by the other disciplines drawings. | | | | o | o | |

## Fire Protection and Hydraulics Engineering Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Confirm size and location of all new utilities connections to existing services. | | o | o | o | o | |
| Confirm that plumbing fixtures, supply and drain locations match architectural. | | | o | o | o | |
| Confirm storm drainage locations and details against architectural. | | o | o | o | o | |
| Check perimeter foundation drainage against architectural. | | | | o | o | |
| Confirm supply size of any fixtures requiring special volume supply, such as hot tubs and large spas. | | | o | o | o | |
| Verify wall chases, recesses and ducts on architectural at vertical piping locations. | | | o | o | o | |
| Confirm that no wet piping is run in unheated spaces (freezing climate only). | | | o | o | o | |
| Confirm that all vents are shown on roof plan. | | | | o | o | |
| Confirm that access panels are provided for all concealed valves. | | | | o | o | |
| Confirm that materials, descriptions are in specification and not on drawings. | | | | o | o | |
| Confirm that all equipment items requiring electrical connections, e.g., pumps, whirlpool baths and drinking fountains, are shown on electrical drawings. | | | | o | o | |
| Confirm that all conditions of the fire brigade approval are met by the building and fire systems design. | | | o | o | o | |
| Confirm that the sprinkler system design is in compliance with statutory requirements and insurer's requirements. | | | o | o | o | |
| Confirm that the fire alarm system is in compliance with statutory requirements and insurer's requirements. | | | o | o | o | |
| Check all plumbing fixtures against the fixture schedule. | | | | o | o | |
| Check all plumbing fixtures against the specification. | | | | o | o | |
| Check all taps and fittings against the fixture schedule. | | | | o | o | |
| Check for missing or incomplete drawing notes. | | | | o | o | |
| Check the fire protection hydraulics specification against the fire protection and hydraulics drawings. | | | | o | o | |
| Confirm calculations for gutter sizes; check box gutters for overflows. | | | o | o | o | |
| Check the coordination of sprinkler heads/detectors with lighting and mechanical air diffusers on reflected ceiling plans. | | | | o | o | |
| Check that a drain has been provided for the fire sprinkler control valve set. | | | | o | o | |
| Check that provision (a drain or openable window) has been made for performance testing of the hydraulically least favourable hydrant or hose reel. | | | | o | o | |

## Mechanical Services Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Verify mechanical floor plans and space allocations against architectural. | | o | o | o | o | |
| Confirm that adequate ceiling height clearances exist at intersections of the largest ducts, including construction tolerances. | | o | o | o | o | |
| Confirm that ducts fit within clear height at raised floors. | | o | o | o | o | |
| Check duct clearances at all deep beams and congested zones. | | o | o | o | o | |
| Verify locations of structural supports at all items of mechanical equipment; compare with structural documentation. | | | o | o | o | |
| Verify that smoke and fire dampers are indicated where required. | | | | o | o | |
| Check grilles and diffusers against reflected ceiling plans. | | | | o | o | |
| Verify that exhaust fans and relief vents are shown on the roof plan. | | | | o | o | |
| Verify that wall air conditioners, fans, grilles and louvres are shown on elevations. | | | | o | o | |
| Verify that equipment will fit in space provided; check service clearances. | | o | o | o | o | |
| Verify the clearance of the installation path for equipment installed after walls are up. | | | | o | o | |
| Verify door undercuts and door grilles against door schedule. | | | | o | o | |
| Verify that material descriptions are in the specification and not on drawings. | | | | o | o | |
| Check that provision for duct cleaning access are accessible. | | | | o | o | |
| Check equipment items on plans against mechanical schedules. | | | | o | o | |
| Verify that electrical connections are shown on electrical plans and schedules for all items requiring power connections. | | | | o | o | |
| Verify locations of condensate drains on the architectural documentation. | | | | o | o | |
| Check for missing or incomplete drawing notes. | | | | o | o | |
| Check the mechanical specification against the mechanical drawings. | | | | o | o | |
| Confirm sizes and locations of all equipment plinths to be supplied by the contractor. | | | | o | o | |
| Check and confirm that all contractors, work required by mechanical services installation are included in the architectural specification. | | | | o | o | |

## Civil Engineering Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Verify site dimensions against survey. | | | o | o | o | |
| Verify that easements are indicated. | | o | o | o | o | |
| Verify that proposed and existing grades are shown and keyed; check against survey. | | o | o | o | o | |
| Verify items of demolition, clearing limits and grading limits. | | o | o | o | o | |
| Verify that new site construction does not interfere with existing features to remain including poles, pole guys, manholes, drain inlets and valve boxes. | | o | o | o | o | |
| Cross- check all new utilities for interference; verify invert levels and clearances at all crossings. | | | o | o | o | |
| Verify that underground utilities are shown on the ground section drawings. | | | o | o | o | |
| Confirm that plan dimensions and profile dimensions match the scaled dimensions for the utility structures. | | | | o | o | |
| Verify that indicated falls match invert levels and distances. | | | | o | o | |
| Verify hydrant and utility pole locations. | | | | o | o | |
| Verify the elevation adjustment to finished grades of manhole castings, valve boxes, and other access. | | | | o | o | |

## Lifts and Escalator Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Request analysis of cost options in lift design, speeds, capacities and waiting times. | | o | o | o | o | |
| Verify that the quantity surveyor has been advised of the provisional sum for lifts, etc. | | | o | o | o | |
| Check lift and escalator details against structural drawings. | | | | o | o | |
| Check sizes and heights of motor rooms and overruns against architectural. | | | o | o | o | |
| Confirm lead times for ordering of cars and equipment against construction schedule. | | | | o | o | |
| Check standard lift door opening details against architectural details. | | | | o | o | |
| Confirm estimates for car interiors against cost plan allowances. | | | o | o | o | |
| Obtain sample service agreements; review for conformity with specifications and submit to the client. | | | | o | o | |
| Verify shaftway sizes, all levels. | | | o | o | o | |
| Confirm that the fireman's lift complies with fire service requirements. | | | | o | o | |
| Confirm security requirements for lifts and coordinate with communication system. | | o | o | o | o | |
| Check for missing or incomplete drawing notes. | | | | o | o | |

## Electrical Services Coordination

| Design Process | Included in Scope | Schematic | Developed | Detailed | Construction | Comments |
|---|---|---|---|---|---|---|
| Confirm location, size, access and other details of substation, vault rooms, or other provision for power supply against architectural. | | | o | o | o | |
| Verify electrical floor plans and dimensions against architectural. | | | o | o | o | |
| Confirm that all light fixtures are shown on architectural reflected ceiling plans. | | | o | o | o | |
| Verify that sufficient height exists for all recessed fixtures. | | | o | o | o | |
| Confirm that recessed fixtures are not in conflict with beams and ducts. | | | o | o | o | |
| Verify location and space requirements of all electrical and other service panels; check requirements for radius dimensions of large conduits. | | | o | o | o | |
| Verify that material descriptions are in specification and not on drawings. | | | | o | o | |
| Check lighting fixture schedule against drawings and the specification. | | | | o | o | |
| Verify electric strike releases, hold open devices and security switches with door schedule. | | | | o | o | |
| Confirm location of incoming services ducts (power/communications). Co-ordinate entry heights/bending radius of ducts. | | o | o | o | o | |
| Confirm electrical services rooms' requirements match architectural. | | | o | o | o | |
| Verify that suspended exit signs are clear of full-height doors. | | | | o | o | |
| Verify that underground external wiring provision for building lighting is shown on sitework drawings. | | | o | o | o | |
| Verify light switch positions against door swings. | | | | o | o | |
| Check for missing or incomplete drawing notes. | | | | o | o | |
| Check the electrical specification against electrical drawings. | | | | o | o | |

# Appendix C
# Sample Coordination Checklists

Editable versions of the Sample Coordination Checklists can be downloaded from www.fidic.org/dos

The FIDIC Bookshop supplies both printed and formated electronic versions, see www.fidic.org/bookshop

# Appendix D
# Construction Monitoring Services

Five levels can be defined for Construction Monitoring Services. The appropriate level for a given project will depend on the:

- Size of the project
- Importance of the project
- Complexity of the construction works
- Experience and demonstrated skill in quality management of the contractor.

Table D1 setting out the five levels of Construction Monitoring (CM), describes the types of review and indicates where a particular level of monitoring is appropriate. Tables D2 and D3 provide rating values for various aspects of a project to enable an assessment of an appropriate monitoring level to be made. The level of Construction Monitoring suitable for a project can be obtained as follows: select value of $K_A$ to $K_D$ from Table D2 and sum the total $K_{TOTAL}$ (a value for each K-factor must be included). Then use Table D3 to select the level of Construction Monitoring that is appropriate. Indicative fees as a percentage of the construction cost are given in Table D4.

| CM | Type of review | Comments on where appropriate |
|---|---|---|
| 1 | - Monitor the outputs from another party's quality assurance programme against the requirements of plans and specifications.<br>- Visit the works at a frequency agreed with the client to review important materials of construction, critical work procedures and/or completed plant or components.<br>- Be available to advise the constructor on the technical interpretation of the plans and specifications.<br>- Review, preferably at the earliest opportunity, a sample of each important work procedure, material of construction and component for compliance together with the requirements of the plans and specifications. | This level is only a secondary service. It may be appropriate:<br>- For the design consultant when another party is engaged to provide a higher level of construction monitoring or review during the period of construction.<br>- When the project works are the subject of a performance-based specification and performance testing is undertaken and monitored by others. |
| 2 | - Review a representative sample of each important completed work prior to enclosure or completion as appropriate.<br>- Be available to provide the contractor with a technical interpretation of the plans and specifications. | This level of service is appropriate for smaller projects of a routine nature being undertaken by an experienced and competent contractor and where a higher than normal risk of non-compliance is acceptable. It provides for the review of a representative sample of work procedures and materials of construction. The assurance of compliance of the finished work is dependent upon the contractor completing the work to at least the same standard as the representative sample reviewed. |
| 3 | - Review, to an extent agreed with the client, *random samples* of important work procedures, for compliance with the requirements of the plans and specifications and review *important* completed work prior to enclosure or on completion as appropriate.<br>- Be available to provide the constructor with technical interpretation. | This level of service is appropriate for medium-sized projects of a routine nature being undertaken by an experienced contractor when a normal risk of non-compliance is acceptable. |
| 4 | - Review, at a frequency agreed with the client, *regular samples* of work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review the *majority* of completed work prior to the enclosure or on completion, as appropriate. | This level of service is appropriate for projects where a lower than normal risk of non-compliance is required. |
| 5 | - Maintain personnel on site to *constantly* review work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review completed work prior to enclosure or on completion, as appropriate. | This level of service is appropriate for: major projects; projects where the consequences of failure are critical; projects involving innovative or complex construction procedures. It provides the client with the greatest assurance that the completed work complies with the requirements of the plans and specifications. |

Table D1 - The five levels of Construction Monitoring

# Appendix D
# Construction Monitoring Services

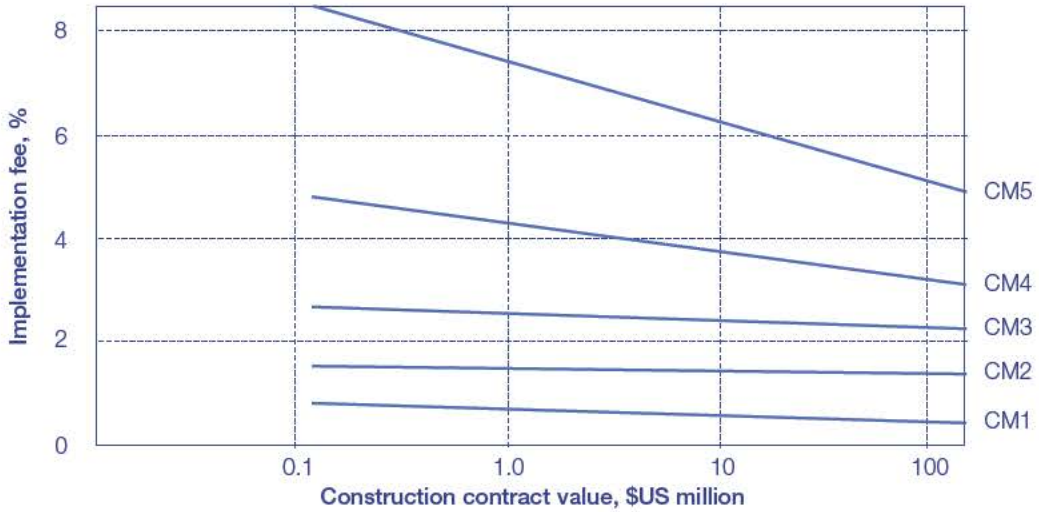
| K | Criteria | Assessment | | | | Value |
|---|---|---|---|---|---|---|
| $K_A$ | Project status | Small<br>1 | Medium<br>2 | Large<br>3 | Major<br>4 | |
| $K_B$ | Complexity of project works | Routine<br>2 | Difficult<br>4 | Complex<br>6 | | |
| $K_C$ | Relevant experience of the contractor | Inexperienced<br>6 | Experienced<br>2 | Certified ISO 9000<br>1 | | |
| $K_D$ | Consequences of non-compliance | Minor<br>1 | Moderate<br>4 | Serious<br>6 | Critical<br>12 | |

Table D2 - Complexity matrix to determine the K-value for a particular project. Use $K_{TOTAL} = K_A + K_B + K_C + K_D$ to select the level of construction monitoring appropriate from Table D3.

| $K_{TOTAL}$ | CM1 | CM2 | CM3 | CM4 | CM5 |
|---|---|---|---|---|---|
| 5 - 6 | | Sampling only | - | - | - |
| 7 - 8 | | n/a | Weekly | - | - |
| 9 - 10 | | n/a | Twice weekly | - | - |
| 11 - 12 | Secondary service | n/a | n/a | Twice weekly | - |
| 13 - 14 | Secondary service | n/a | n/a | Every second day | - |
| 15 - 16 | | n/a | n/a | Daily | - |
| 17+ | | n/a | n/a | n/a | Constant |

Notes
- Frequency of inspection is intended to be indicative of the involvement, with the actual frequency depending upon the rate of progress of the works.
- n/a: not appropriate.
- Secondary service: this level of service is only appropriate when another party is responsible for undertaking the primary review of construction standards.

Table D3 - Level of construction monitoring (frequency of review considered to be appropriate for a project).




Note: this table is generic and is only to show the relative input for the different monitoring levels. The actual percentages will vary depending on the market and project type.

Fig. D4 - Indicative fee (percentage of project cost) required for the Construction Monitoring levels.

# Further information


1 *FIDIC Definition of Services Guidelines (Building Construction) – Detailed Task Descriptions*, 2009; www.fidic.org/dos

2 *FIDIC Construction Contract* for Building and Engineering Works designed by the Employer, 1st Edition, 1999.

3 *FIDIC Project Sustainability Management Guidelines*, 2004; www.fidic.org/psm

4 *FIDIC Business Integrity Management System Guidelines*, Test Edition, 2001; www.fidic.org/bims

5 *FIDIC Guidelines for the Selection of Consultants*, 1st Edition, 2003.

6 *FIDIC Client/Consultant Model Services Agreement*, 4th Edition, 2006.

7 Client/Consultant Model Services Agreement (1999 White Book) Guide 2nd Edition, 2001.

8 *Design Documentation Guidelines*, New Zealand Construction Industry Council, 2004; www.nzcic.co.nz/design.cfm



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